CLAIMS

1   1. A system for modifying input image data used by a projector in generating a

2   displayed image, the projector supporting number of unique levels, the system compris-

3   ing:

4   a luminance uniformity engine configured to process the input image data so as to

5   generate corrected image data that is uniform in luminance;

6   a dither engine configured to process the corrected image data from the luminance

7   uniformity engine so as to generate dithered image data; and

8   a converter configured to convert the dithered image data into the unique levels of

9   the projector.

1   2. The system of claim 1 wherein the luminance uniformity engine comprises:

2   a front-end look-up table (LUT) that imposes a gain on the input level to produce

3   a resulting input level;

4   a spatial attenuation array configured with a plurality of distortion correction val-

5   ues; and

6   a multiplier circuit for multiplying the resulting input level from the front-end

7   LUT by a selected distortion correction value from the spatial attenuation array to pro-

8   duce a luminance corrected input level.

1   3. The system of claim 2 wherein

2   the input image data includes a level and x,y coordinates for each level, and

3   the distortion correction values of the spatial attenuation array are indexed by the

4   x,y coordinates of the input image data.

1   4. The system of claim 1 wherein the dither engine comprises:

2   a dither array configured with a plurality of dither values;

3   an adder circuit configured to generate a sum by adding a selected dither value to

4   the luminance corrected input level; and

5   a shift register configured the shift the sum by a selected number of bits, thereby

6   producing a dithered output level.

1   5. The system of claim 4 wherein

2   the dither engine has a number of input levels and a number of output levels, and

3   the number of output levels of the dither engine is one of equal to and greater than

4   the number of stated levels of the projector.

1   6. The system of claim 3 wherein

2   the input image data includes a level and x,y coordinates for each level, and

3   the dither values are indexed by the x,y coordinates of the levels of the input im-

4   age data.

1   7. The system of claim 4 wherein the converter is a back-end look-up table (LUT)

2   that is configured to map dither output levels to unique projector levels.

1   8. A method for correcting projector non-uniformity and increasing apparent am-

2   plitude resolution, the projector supporting a stated number of levels, the method com-

3   prising the steps of:

4   measuring the projector non-uniformity at a plurality of the stated levels;

5   determining the number of unique levels supported by the projector;

6   utilizing the non-uniformity measurements to generate uniform projector image

7   data; and

8   dithering the modified projector image data such that a displayed image appears

9   to have been formed either from the stated number of levels or from a greater number of

10   levels than the stated number.

1   9. The method of claim 8 wherein the step of determining the number of unique

2   projector levels comprises the steps of:

3   generating a displayed image from the projector for each of the plurality of stated

4   projector levels;

5   capturing each of the displayed images with a camera, each camera captured im-

6   age having a plurality of pixel values;

7   averaging all of the pixel values for each camera captured image; and

8   comparing the averaged pixel values computed for two adjacent stated projector

9   levels to determine whether the two stated projector levels are unique.

1   10. The method of claim 9 wherein the step of comparing the averaged pixel val-

2   ues comprises the steps of:

3   computing the difference between the averaged pixel values for the two adjacent

4   stated projector levels;

5   finding the two adjacent stated projector levels to be unique provided that the

6   computed difference is greater than a threshold times the difference between a maximum

7   averaged pixel value considering all of the plurality of stated levels and a minimum aver-

8   aged pixel value considering all of the plurality of stated levels; and

9   finding the two adjacent stated projector levels to be redundant provided that the

10   computed difference is less than a threshold times the difference between the maximum

11   averaged pixel value and the minimum averaged pixel value.

1   11. The method of claim 10 wherein the threshold is on the order of 0.001.

1   12. The method of claim 8 wherein the uniform projector image data has a plural-

2   ity of corrected levels, and the step of dithering the uniform projector image data com-

3   prises the step of utilizing a selected dither template pattern to convert the corrected lev-

4   els of the uniform image data to corresponding dither output levels.

1   13. The method of claim 8 further comprising the step of mapping each dither

2   output level to a respective unique output level supported by the projector.

1   14. The method of claim 13 wherein the selected dither template pattern is a void

2 and cluster pattern.